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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/624,871	07/21/2003	Toshikazu Kitajima	P/2699-26	7650
2352	7590	11/03/2004	EXAMINER	
OSTROLENK FABER GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NY 100368403			SUN, XIUQIN	
			ART UNIT	PAPER NUMBER
			2863	

DATE MAILED: 11/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/624,871	Applicant(s) KITAJIMA ET AL.	
	Examiner Xiuqin Sun	Art Unit 2863	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 June 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 4-6 and 10-14 is/are allowed.
- 6) ☒ Claim(s) 1-3 and 7-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 1-3 and 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Verkuil (U.S. Pat. No. 5485091) in view of Hirae et al. (U.S. Pat. No. 5475319) and Okada et al. (U. S. Pat. No. 6278267).

Verkuil teaches a method and apparatus of measuring the thickness of an insulator film formed on one surface of a semiconductor substrate, in a non-contact manner with respect to the insulator film (see Abstract), comprising: a charging processing step and means of charging the insulator film surface in a non-contact manner (col. 3, lines 31-40 and col. 6, lines 13-39); a charge amount measuring step and means of measuring the charge amount (col. 6, lines 13-39); a surface potential measuring step and means of measuring, after the charging processing step, the insulator film surface potential in a non-contact manner with respect to the insulator film (col. 3, lines 41-60 and col. 6, lines 13-39); and a step and means of calculating the insulator film thickness based on the charge amount measured at the charge amount measuring step and on the surface potential measured at the surface potential

measuring step (col. 2, lines 5-54 and cols. 3-5, lines 61-32). Verkuil further teaches: the charging processing step comprises a step of charging the insulator film surface by corona discharge (Abstract).

Verkuil does not teach: said charge amount measuring step and means comprising: obtaining a first flat band voltage by conducting, prior to the charging processing step, a C-V measurement on the semiconductor substrate in a non-contact manner with respect to the insulator film; obtaining a second flat band voltage by conducting, after the charging processing step, a C-V measurement on the semiconductor substrate in a non-contact manner with respect to the insulator film; calculating, based on a difference between the first and second flat band voltages, the charge amount given to the insulator film surface by the charging processing step; a holding stand operable for moving the semiconductor substrate between the charging processing unit, the charge amount measuring unit and the surface potential measuring unit, wherein the charging processing step, the charge amount measuring step and the surface potential measuring step are conducted while the semiconductor substrate is held on said holding stand; and the charging processing step comprises a step of irradiating, onto the semiconductor substrate, ultraviolet rays having a wavelength of not less than 220 nm and not greater than 300 nm.

Hirae et al. disclose a method of measuring electric charge of semiconductor wafer, and teach a charge amount measuring step comprising (see Abstract): a step of obtaining a first flat band voltage by conducting, prior to the charging processing step, a C-V measurement on the semiconductor substrate in a non-contact manner with

respect to the insulator film; a step of obtaining a second flat band voltage by conducting, after the charging processing step, a C-V measurement on the semiconductor substrate in a non-contact manner with respect to the insulator film; and a step of calculating, based on a difference between the first and second flat band voltages, the charge amount given to the insulator film surface by the charging processing step (cols. 1-2, lines 53-65 and cols. 6-7, lines 10-39).

In view of the teaching disclosed by Hirae et al., one having ordinary skill in the art at the time the invention was made would be able to utilize the Hirae algorithm to measure the charge amount accurately in the method of Verkuil so that the thickness of the insulator film can be estimated explicitly from known dielectric constant, the surface potential and the charge amount (Verkuil, col. 3, lines 41-60; Hirae et al., cols. 1-2, lines 53-65).

Okada et al. teach a method and apparatus for determining the amount of impurities present in the vicinity of an insulating film formed on surface of a substrate, including: a charging processing step and unit comprises a step of irradiating, onto the semiconductor substrate, ultraviolet rays having a wavelength of not less than 220 nm and not greater than 300 nm (col. 3, lines 48-67; col. 4, lines 1-10; col. 5, lines 24-65; col.6, lines 30-64; col. 7, lines 12-23 and lines 57-67 and col. 8, lines 1-17); and a holding stand operable for moving the semiconductor substrate between the charging processing unit, a charge amount measuring unit and a surface potential measuring unit, wherein the charging processing step, the charge amount measuring step and the surface potential measuring step are conducted while the semiconductor substrate is

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held on said holding stand (Fig. 9; col. 4, lines 11-21; col. 9, lines 2-11 and col. 11, lines 8-25)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to include the teaching of Okada et al. in the combination of Verkuil and Hirae et al. in order to effectively neutralize the intra-film ions (Okada et al., col. 1, lines 36-60) and facilitate the operations of charge amount measuring unit and a surface potential measuring unit (Okada et al., col. 9, lines 2-11 and col. 11, lines 8-25).

Allowable Subject Matter

3. Claims 4-6 and 10-14 are allowed.

Reasons for Allowance

4. The following is an examiner's statement of reasons for allowance:

The primary reason for the allowance of independent claims 4-6 and 10-14 is the inclusion of the claimed method step and apparatus means of calculating the insulator film relative dielectric constant based on the charge amount measured at the charge amount measuring step and on the surface potential measured at the surface potential measuring step. It is this step found in each of the claims, as it is claimed in the combination that has not been found, taught or suggested by the prior art of record, which makes these claims allowable over the prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Prior Art Citations

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- 1) Watanabe (U. S. Pat. No. 5593910) is directed to a charge detection device, a method for producing the same, and a charge transfer and detection apparatus including such a charge detection device.
- 2) Nakano et al. (U. S. Pat. No. 6153444) is directed to a method of measuring free carrier concentration and/or thickness of a semiconductor and process of manufacturing semiconductor device and semiconductor wafer using such method.
- 3) Horie (U. S. Pat. No. 5440141) is directed to a method of measuring a thickness of a multilayered sample using ultraviolet light and light with wavelengths longer than ultraviolet.

Response to Arguments

6. Applicants' arguments with respect to claims 1-3 and 7-9 have been considered but are moot in view of the new ground(s) of rejection.

Claims 1-3 and 7-9 are rejected as new prior art (U. S. Pat. No. 6278267 to Okada et al.) has been found to teach the limitation of a holding stand operable for

moving the semiconductor substrate horizontally. Detailed response is given in section 2 as set forth above in this Office Action.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

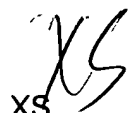
Contact Information

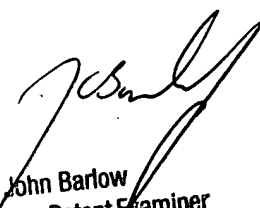
8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Xiuqin Sun whose telephone number is (571)272-2280. The examiner can normally be reached on 6:30am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on (571)272-2269. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Xiuqin Sun
Examiner
Art Unit 2863


XS
October 28, 2004


John Barlow
Supervisory Patent Examiner
Technology Center 2800